PROJECT SPECIFIC PLAN FOR DRILLING THREE NEW RE-INJECTION WELLS ALONG WILLEY ROAD

PROJECT NUMBER 52423-PSP-001902

Revision 0, Final

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TABLE OF CONTENTS

1.0 Introduction 1

2.0 Management and Organization 5

3.0 Field Activities 7
3.1 Surveying and Staking Well Locations 7
3.2 Collection of Sediment Cores 7
3.3 Re-Injection Well Installation 8
3.5 Well Development 9

4.0 Equipment Decontamination 12

5.0 Waste Disposal 13

6.0 Health & Safety 14

7.0 Quality Assurance/Quality Control Requirements 15
7.1 Project Requirements for Surveillance 15
7.2 Changes to the Project Specific Plan 15

8.0 Data Management 16

LIST OF TABLES

Table 1 Sampling Analytical Requirements (ASL B) 17

LIST OF FIGURES

Figure 1 Well Locations 18

Figure 2 Cross Section from Direct –Push Location 12372 to 12373 19

1.0 INTRODUCTION

This Project Specific Plan (PSP) serves as the controlling document for the installation of three re-injection wells IW-8a, IW-9a, and IW-10a along Willey Road. IW-8a, IW-9a, and IW-10a will be identified in the Site Environmental Database (SED) as 33253, 33254, and 33255 respectively. Two of the wells will be replacement wells, and the third well will be a new well. Re-Injection Well IW-8a will replace Re-Injection Well IW-8. Re-Injection Well IW-9a will replace Re-Injection Well IW-9, and Re-Injection Well IW-10a will be a new re-injection well that will be located midway between IW-10 and IW-11. The locations of these three wells are shown in Figure 1.

All drilling and sampling activities will conform to the guidelines set forth in the Sitewide CERCLA Quality Assurance Manual (SCQ), unless otherwise specified in this PSP. Performance of the requirements specified in Standard Operating Procedure (ADM-02, Field Prerequisites) shall precede all field activities.

Need for Three New Re-Injection Wells

The decision to install these three wells stems from a combination of the following:

- IW-8 and IW-9 have reached established site criteria for either replacing or abandoning a re-injection well. A re-injection well is either replaced or abandoned when the annual rehabilitation cost equals the cost to install a new well.
- A new uranium groundwater FRL of 30 µg/L was adopted for use at the site. Adopting this new FRL resulted in a smaller uranium plume being targeted for remediation. Because the target plume has decreased in size, IW-8 is no longer located within the uranium plume being targeted for remediation.
- The need to better flush uranium contamination from stagnant zones located between existing re-injection wells along Willey Road. One such area with the highest measured uranium concentration is located between IW-10 and IW-11.

Cost criteria have been established for the site to determine when a groundwater re-injection well should be replaced or abandoned. If the annual rehabilitation cost equals the cost of installing a new well, then the well will be either replaced or abandoned. The decision is based upon remediation needs at the time that the well meets the criteria. Last year the site adopted a new re-injection well treatment procedure that has proven to be much more effective than the old procedure that was being used. Cost wise, four re-injection well treatments utilizing the new method approximately equals the cost of

installing a new re-injection well. This means that a re-injection well needs to operate for three months or more between well treatments in order to remain cost effective. IW-8 and IW-9 currently do not operate longer than three months between treatments. As explained below, the decision has been made to replace these wells, rather than abandon re-injection in this area.

Figure 1 shows the outline of the 30 μg/L total uranium plume in relation to existing and planned re-injection wells. When Re-Injection Well IW-8 was originally installed the Final Remediation Level (FRL) for uranium in groundwater was 20 μg/L and the re-injection well was situated within the 20 μg/L total uranium plume. As shown in Figure 1, Re-Injection Well IW-8 is no longer within the uranium plume being targeted for cleanup. Groundwater remediation efforts, flushing due to recharge from Paddy's Run located just to the west of the IW-8, and redefining the plume based on the 30 μg/L concentration instead of 20 μg/L has shifted the trailing edge of the uranium plume being targeted for remediation to the east. To keep re-injection within the boundaries of the plume being targeted for remediation, IW-8 should also be re-located to the east.

Any replacement well for a re-injection well needs to avoid being installed in plugged or potentially plugged sediments. Most of the plugging in these existing re-injection wells has probably occurred just outside of the well screen, essentially within a few feet of the well in all directions. However it likely that some degree of plugging also occurred further out in the aquifer. The greatest potential for this occurring is directly downgradient (south) of the re-injection wells as this is the direction in which most of the re-injected water went. The best probability for avoiding potentially plugged sediments within the aquifer would be to relocate the wells either to the east or to the west of their present locations. Water injected between existing re-injection locations would miss the potentially plugged areas south of the re-injection wells. In this case, since the trailing edge of the uranium plume has shifted to the east, it makes sense that the replacement well for IW-8 should also be relocated to the east. Since IW-8a will be installed to the east of IW-8, between IW-8 and IW-9, the decision was made to install IW-9a east of IW-9, between IW-9 and IW-10.

A conclusion of the Re-Injection Demonstration was that stagnant zones were present between the existing re-injection wells. Flushing of uranium contamination downgradient (south) of the re-injection wells was much more efficient relative to the flushing that took place between (east and west) the re-injection wells. The flushing pattern that developed at the five existing re-injection wells indicated

that the injected water preferentially followed a southerly gradient creating a flushing pattern that was elongated to the south, in the direction of groundwater flow. Given the distance between the re-injection wells, and the prolific ability of the aquifer to accept re-injected water, increasing re-injection rates in the existing re-injection wells will not fully flush the stagnant zones between the wells. The larger amount of injected water would simply be swept downgradient to the south. A strategy for increasing the efficiency of the flushing between the existing re-injection wells (in the stagnant zones) is to install additional re-injection wells there. Installing IW-8a midway between IW-8 and IW-9 and installing IW-9a midway between IW-9 and IW-10 are consistent with this strategy.

Uranium concentration data indicates that the area between IW-10 and IW-11 has some of the highest uranium concentrations remaining along Willey Road. As explained earlier, this area is relatively stagnant because it lies between existing re-injection wells. Therefore, the decision was made to install a new well (IW-10a) midway between IW-10 and IW-11 to better flush this high concentration area and accelerate the aquifer remediation.

Well Design Considerations

The well design for this PSP will be essentially the same as the design used for the existing re-injection wells with the following exceptions.

- **All of the wells will have a sixteen-inch diameter.** The up front added costs for installing a 16-inch diameter well instead of smaller diameter well will more than pay for itself over the operational life of the well. Larger diameter wells require fewer treatments for plugging than the smaller diameter wells do.

- **All of the wells will be completed using an artificial filter pack.** Of the three 16-inch wells operating since 1998, the two completed with an artificial filter pack (IW-11 and IW-12) performed better than the one (IW-10) completed with a natural filter pack.

- **Only one downcomer will be installed in each well.** Four of the five existing re-injection wells were installed with two downcomers (IW-9, IW-10, IW-11, and IW-12). Over the past four years the smaller downcomer was hardly ever utilized indicating that it was not really needed.

- **Well screens will be longer to more efficiently flush lower regions of the uranium plume.** When IW-8, IW-9, IW-10, IW-11, and IW12 were installed a concern existed that re-injecting into deeper regions of the plume could lead to more plugging within the well. Groundwater in the aquifer has lower Eh readings at depth indicating more reduced conditions. Since the injectate is relatively oxidized, it was thought that injection into the deeper reduced areas of the aquifer would mix relatively oxidized water being injected with the relatively reduced water in

the aquifer and could result in increased iron plugging problems within the well. However, the uranium plume at IW-11 was deeper than other areas, and this left no choice but to install the screen in IW-11 deeper than the other four locations. Operational experience at IW-11 has shown that the deeper screen in this well did not result in more iron plugging problems, as it was feared that it might. Therefore screen lengths for these three replacement wells will be longer than the original wells so as to provide more flushing within the lower portion of the plume and to help reduce maintenance costs. The added length to the screens should improve the operational efficiency of the new wells. More open screen area will be provided to inject water out of. More open area will take more time to plug so the wells should operate longer between needed maintenance treatments.

Installation/Development Considerations

- Following development, the well will be chlorinated using a mixture of water, sodium hypochlorite and NW-310 as outlined in the *Scope of Work for Acid and Chlorination Treatments of Re-Injection Wells, Rev 0, Final.* The Technical Lead will provide volume information for the mixture.

- Uranium analysis of the pumped water during development will be conducted in the AWWT Lab.

- Sieving of the cores will be conducted at an offsite lab. A gross alpha/beta screen will be conducted prior to shipment.

- Rotosonic Core from IW-10a will be temporarily archived for later Kd work.

2.0 MANAGEMENT AND ORGANIZATION

The DOE Operable Unit 5 Team Leader is responsible for:

- Acting as the point of contact within DOE and for the regulators and stakeholders for all communications concerning work carried out under this PSP.

The Aquifer Restoration/Wastewater Project (ARWWP) Manager is responsible for:

- Providing overall project management and technical guidance
- Ensuring the necessary resources are allocated to the project for the efficient and safe completion of PSP activities
- Overseeing and auditing PSP activities to ensure that the work is being performed efficiently and in accordance with all regulatory requirements and commitments, DOE Orders, site policies and procedures, and safe working practices.
- Establishing and maintaining the scope, schedule, and cost baseline.
- Providing a technical lead for the oversight and programmatic direction of sampling activities and the interpretation of sampling data.

The ARWWP Technical Lead is responsible for:

- Reporting to the ARWWP Manager and Hydrogeology Section Manager on the progress of PSP activities and on the identification of any problems encountered in the accomplishment of the PSP
- Providing technical guidance and assisting field personnel as required to complete work described in this PSP
- Interpretation of data collected in the field.

The Fluor Fernald Environmental Monitoring Groundwater Monitoring Section Team Coach is responsible for:

- Managing and conducting field activities.
- Submitting field data for entry into the Site Environmental Database (SED).
- Safety walk downs of the work areas, ensuring personnel are trained to safety and technical requirements, procuring applicable work permits, and ensuring that safety and PSP requirements are being adhered to during field implementation.
- Reporting field progress to the ARWWP Hydrogeology Section Manager and Technical Lead

The key project personnel are listed below:

KEY PROJECT PERSONNEL

TITLE	PRIMARY	ALTERNATE
DOE Operable Unit 5 Team Leader	Rob Janke	
ARWWP Manager	Dave Brettschneider	
ARWWP Technical Safety Contact	Keith Lanning	Andy Cleeter
ARWWP Hydrogeology Section Technical Lead	Ken Broberg	Bill Hertel
EM Water Monitoring Section Team Coach	Karen Voisard	
Laboratory Contact	Brenda Collier	
ARWWP Environmental Compliance Lead	Frank Johnston	
Quality Assurance Contact	Mike Hoge	Frank Thompson

3.0 FIELD ACTIVITIES

3.1 SURVEYING AND STAKING WELL LOCATIONS

The ground elevation and location of each well location will be surveyed. A survey stake will be driven into the ground at each location and labeled. Field crews shall conform to the requirements stated in Procedure No. SH-0018, *Penetration Permits*, Rev. 5, September 17, 2001, (or future revisions) prior to penetrating the ground surface beyond 6 inches at each sampling location. The corresponding well location number will be written on the survey stake. Final survey data for each location will be entered into the Site Environmental Database (SED). Consideration to existing vegetation and trees will be given as the wells are being located. Re-location of a well will be considered to spare existing vegetation if it is determined that the re-location will not compromise the objective of the well. Well locations will also take into consideration future excavation work, buried utilities, overhead electric wires, and surface features. Survey coordinates for these three wells are as follows:

- IW-8a, (Well 33253) E 1348187.866, N 476222.010, Surface Elevation = 567.488 feet amsl
- IW-9a, (Wells 33254) E 1348619.130, N 476139.952, Surface Elevation = 577.516 feet amsl
- IW-10a, (Well 33255) E 1349086.932, N 476261.522, Surface Elevation = 564.12 feet amsl

3.2 COLLECTION OF SEDIMENT CORES

Prior to drilling the 24-inch diameter boring needed for the installation of the re-injection well, a 4-inch diameter Rotosonic core will be collected. Samples of aquifer material taken from the core will be sieved. The grain size results will be used to select the most efficient slot size possible for the well screen. The objective of the screen design will be to maximize screen-transmitting capacity while maintaining an average entrance velocity of no more than 0.05 feet per second at an injection rate of 200 gpm. Soil samples will be collected in accordance with DRL-02, *Solids Sampling in Drilled Boreholes*. A four-inch diameter rotosonic core will be obtained for sieving from the following depth intervals.

- IW-8a, a 25 foot interval, 52.5 feet bgs to 77.5 feet bgs, (515 feet amsl to 490 feet amsl)
- IW-9a, a 25 foot interval, 62.5 feet bgs to 87.5 feet bgs (515 feet amsl to 490 feet amsl)
- IW-10a, a 40 foot interval, 49 feet bgs to 89 feet bgs (515 feet amsl to 475 feet amsl)

Figure 2 illustrates the position of these target sample intervals relative to direct push locations 12372 and 12373. These two locations are situated between re-injection wells, and have been routinely sampled since the start of re-injection in September of 1998. Therefore they provide the best measurement of the depth of the uranium plume between the re-injection wells and what interval needs to be targeted for the collection of sediment samples.

A geologist will prepare brief lithologic descriptions of the soil materials starting at the top of the GMA and transcribe the information into a *Visual Classification of Soils Form.* The lithology and depositional features of the core will be described. Soil samples (500 ml) will be collected from the core and submitted to an offsite laboratory for particle size analysis via sieves to support the selection of screen slot size and length. The ARWWP technical lead will assist with selecting the samples from the core. It is estimated that an average of one sample will be collected for every two feet of core.

After the screen selection sieve samples have been collected, soil samples will also be collected for Kd work. The scope of the Kd work to be performed on the core samples will be defined in a separate PSP. Two depth intervals will be targeted for the collection of soil samples for Kd work; 1) the vadose zone above the present day water level, and 2) the depth interval being targeted for the well screen. The vadose zone target interval for each well will extend from 515 feet amsl (the present elevation of the water table as measured in Monitoring Well 2434 on 1/2/02) to 531 feet amsl. The upper limit of 531 feet amsl is 8 feet above the highest water level ever recorded at Monitoring Well 2434, which is the closest monitoring well to the 10a location. The soil samples collected for Kd work will be placed in one- or two-liter sample jars. The sample jars will be filled as much as possible to minimize any headspace in the jars. The jars will be clearly labeled, sealed, and secured with custody tape for later use.

Once the needed core has been obtained, the borehole will be allowed to collapse naturally up to the water table. If available, a Cable Tool rig will be moved over the open boring and begin drilling the 24-inch diameter borehole required for the installation of the re-injection well without abandoning the boring. If the cable tool rig is not available, the borehole above the water table will be temporarily filled with sand to a height of 10 feet above the water table. Above the sand bentonite chips will be placed in the boring until the cable tool rig is available to drill the larger boring needed for the well casing.

3.3 RE-INJECTION WELL INSTALLATION

A cable tool rig shall be used to advance a 24-inch diameter borehole to the following drilling depths.

- IW-8a, 77.5 feet bgs
- IW-9a, 87.5 feet bgs
- IW-10a, 89.0 feet bgs

11

A geologist will document drilling, installation-, and development activities on standard Field Activity and Well Completion Logs. Well installation shall be performed in accordance with requirements outlined below and, unless otherwise specified shall follow the general guidelines set forth in Appendix J of the SCQ. The well will be 16-inches in diameter. A five-foot long sump will be attached to the bottom of the well screen. The screen and sump will be constructed of 304 stainless steel. Well risers shall be constructed of polyvinyl chloride (PVC).

A final well design will be prepared once the sieve results from the core samples have been obtained. The following is an overview of how the wells will be completed. The wells will be completed using a filter pack. Screen and filter pack design will follow guidelines presented in *Groundwater and Wells*, second edition, by Driscoll, 1986. Injection wells are more likely to fail then pumping wells are. Because of this Driscoll recommends that the screens in injection wells be designed to have an average entrance velocity of 0.05 feet/second rather than 0.1 feet/second that is recommended for extraction wells. Screens with lower entrance velocities are less subject to incrustation. The filter pack sand will extend above the screen and transition sand will extend above the filter pack sand to a minimum of 10 feet above the water table. A five-foot bentonite plug will be installed above the transition sand. Bentonite grout slurry shall extend from the bentonite plug through the till/aquifer interface to three feet below the ground surface. Surface installations will be guided by specifications presented in a separate Design Package. Specific dimensions for the annulus seal will be provided once the sieve results from the core have bee obtained and the length of the screen has been finalized.

3.5 WELL DEVELOPMENT

Well development shall be performed according to Appendix J of the SCQ and DRL-03, Well Development, except where specific requirements outlined below differ. Development shall be initiated no sooner than 48 hours following completion of well installation activities.

Development will begin by surging the well for 24 hours. The surging length of the development rig will be used to define a surge interval. Each surge interval of the well screen will be surged for one hour and the sand contained in the well will be measured and removed prior to beginning the next surge cycle. Surging will begin slowly and gradually increase. Following 24 hours of surging, six hours of development pumping will be conducted for the purpose of measuring the sand content of the pumped well water, the specific capacity of the well, and the uranium concentration of the pumped groundwater. The goal of development will be to produce a well capable of delivering water with a sand content of 10 parts per million (PPM) or less. If the sand content is at or below 10 PPM at the conclusion of the

pumping, development will be judged complete. If the sand content is above 10 PPM at the end of pumping, the development cycle shall be repeated until the Technical Lead determines that the well has been adequately developed.

Project Specific Requirements for Well Development

1. Lower the surge block to the highest surge interval in the screen and surge the interval for one hour.
2. Measure the depth to the bottom of the well. Record the depth in the comment section of the Well Development Form.
3. Using a development rig bailer, remove as much sand as possible from the well. Measure the total depth of the well to verify that the sand has been removed.
4. Lower the surge block to the next surge interval. Surge for one hour.
5. Repeat steps 2 and 3.
6. Lower the surge block to the next higher surge interval. Surge for one hour.
7. Repeat steps 2 and 3.
8. Upon completion of surging at the base of the well screen, raise the surge block back up to the top of the well screen and repeat the process of surging each interval.
9. Continue this process for 24 hours.

Development Pumping

Upon completion of 24 hours of surging, the well will be pumped for 6-hours for the purpose of measuring specific capacity of the well, the sand content and uranium concentration of the pumped water. Discharge instructions for the pumped water are provided in Section 5 of this PSP. Instructions for the pumping are provided below.

1. Measure the total depth and the static water level of the well and record the information on the Field Activity Log.
2. Pump the well for two hours. The technical lead will provide the pumping rates to be used. Measure the water level of the pumping well approximately every 20 minutes. Collect a total U sample at the end of each 2-hour pumping interval.
3. Conduct a sand content measurement after 15 minutes, 30 minutes, 60 minutes, 90 minutes, and 120 minutes of pumping. Steps for conducting a sand content measurement are provided below.
4. After two hours of pumping, increase the pumping rate as specified by the technical lead. Pump the well for two hours and repeat the measurements described in 2 and 3 above.

5. Increase the pumping rate as specified by the technical lead. Pump the well at this rate for two hours and repeat the measurements in 4 and 5 above.

6. After approximately six hours of pumping, stop the pumping.

7. Measure the recovery rate of the well by taking water level measurements every 30 seconds until the water level is to within one foot of the static water level recorded before the start of pumping six hours earlier.

Sand Content Measurement

Sand content will be measured by passing a sample of the pumped well water through a centrifugal sand sampler. The centrifugal sand sampler will be installed in the discharge line used for development, just slightly down gradient of the well head. Operation of the sand content sampler is described below:

1. Install the centrifugal sand content tester as directed by the manufacturer. The inlet should be located on the horizontal centerline of the discharge pipe and as close to the discharge head as possible.

2. Open the inlet valve to the tester wide open. Adjust the outlet valve to one-half gpm. (This will fill one quart in 30 seconds or one gallon in two minutes).

3. Close the inlet valve, remove, clean, and replace the glass tube.

4. When ready to start the sand content measurement, record the start time and open the inlet valve wide open.

5. After five minutes, record the amount of accumulated sand in the glass tube. Calculate the sand rate by dividing the amount of accumulated sand by five minutes (the amount of time to accumulate the sand).

6. Periodically check the flow rate through the tester during each run. If the flow rate is not one half gpm, repeat the measurement.

7. Calculate the rate of sand production per unit of water according to the following calculation:

$$\frac{[\text{sand rate (ml/min)}]}{[0.5 \text{ gpm} \times 231 \text{ in}^3/\text{gallon} \times 16.387 \text{ ml/in}^3]*1E6} = \text{ppm}$$

4.0 EQUIPMENT DECONTAMINATION

If drilling and sampling equipment are being moved from a FEMP Controlled Area, the equipment shall be decontaminated to Level I, using a pressure washer to remove visible materials, prior to transport to the drilling location. Decontamination of the drilling equipment will not be necessary if the equipment has been used previously in a FEMP uncontrolled area. Upon completion of drilling and sampling activities, decontamination of tools and equipment shall be performed to fulfill the Level I specification of the SCQ (Reference Section K).

5.0 WASTE DISPOSAL

The disposal of drill cuttings will be coordinated with and approved by the Manager of the WAO group. Options include spreading the drill cuttings out on the ground surface at the drilling site, or transporting the cuttings to a holding area for later disposal into the OSDF. Final directions for the disposal of the cuttings will be issued prior the commencement of drilling activities for the installation of the well.

Discharged pumping water (generated during well development) will be sent to the 8-inch clean out located on the South Plume Discharge Line just northeast of IW-9. Temporary 4-inch hoses will be utilized to connect each drilling location to the clean out attached on the discharge line. Field personnel will work closely with Wastewater Treatment Operations Personnel to assure that they are aware of the pumping prior to it taking place.

The field geologist will be responsible for assuring that proper coordination with the Wastewater Treatment Operations Group has been achieved prior to the discharge of any water into the South Plume Discharge Line. The Field Geologist will call the AWWT Facility Manager at extension 4660 a day prior to the development pumping. The Field Geologist will also call the AWWT Facility Manager just prior to pumping to assure that coordination is complete and discharge can begin at an agreed to time.

6.0 HEALTH & SAFETY

Personnel and project subcontractors shall conform to precautionary surveys performed by the personnel representing the Utility Engineer, Safety and Health, and Radiological Control. Concurrence to applicable safety permits (indicated by the signature of personnel assigned to this project) is expected from all project personnel in the performance of their assigned duties.

The EM Team Coach will ensure that all EM personnel performing project-related activities have read or been trained to the EM sampling procedures applicable to this work. In addition to the applicable surveys that protect worker safety and health is an acknowledgment of understanding the PSP requirements and safety precautions outlined in the procedures and permits. A copy of applicable safety permits/surveys issued for worker safety and health shall be available for reference/review at each sample location, and at the completion of the project, the completed forms shall be submitted for incorporation into the project files.

17

7.0 QUALITY ASSURANCE/QUALITY CONTROL REQUIREMENTS

Well installation and development work shall follow Quality Assurance/Quality Control (QA/QC) protocol.

7.1 PROJECT REQUIREMENTS FOR SURVEILLANCE

Self-assessment of work processes and operations may be undertaken to assure quality of performance. Self-assessment may be performed by the Environmental Monitoring/Soils and Miscellaneous Media Projects Team Coach, and will encompass technical and procedural requirements. Such self-assessment may be conducted at any point in the project. Independent assessment may be performed by the Fluor Fernald QA organization by conducting surveillances.

7.2 CHANGES TO THE PROJECT SPECIFIC PLAN

Prior to the implementation of changes, the Project Lead and/or Technical Lead shall be informed of the proposed field changes. Once approval has been obtained from the Technical Lead and QA representative for the changes to the PSP, the field changes may be implemented. Variances shall be processed per Section 15.3 of the SCQ.

8.0 DATA MANAGEMENT

A data management process will be implemented so information collected during the well installation activity will be properly managed following completion of the field activities. As specified in Section 5.1 of the SCQ, sampling teams will describe daily activities on the Field Activity Log with sufficient detail so that the sampling team can reconstruct a particular situation without reliance on memory. Sample Collection Logs will be completed according to instructions specified in Section 6.1 of the SCQ.

All field measurements, observations, and sample collection information will be recorded as required and applicable on the Sample Collection Log, the Field Activity Log, and the Chain of Custody/Request for Analysis Form. The method of sample collection will be specified in the Field Activity Log. A unique sample identification number will appear on the Chain of Custody/Request for Analysis and will be used to identify the sample during analysis, data entry, and data management.

Technicians will review all field data for completeness and accuracy and then forward the data package to the Data Quality organization for final review. The field data package will be filed in the records of the Environmental Monitoring project.

The Data Management organization will perform data entry into the Site-Wide Environmental Database. Field logs will be maintained in loose-leaf form during the field recording activities. Analytical data will be reviewed by the Project Lead prior to entry of the data into the SED from the FACTS database.

TABLE 1

SAMPLING ANALYTICAL REQUIREMENTS
(ASL B)

Analyte	Lab[a]	Preservative[a]	Holding Time	Container	Approximate Detection Levels
Gross Alpha/Beta	AWWT	None	6 months	250 ml plastic	
Total Uranium	AWWT	HNO_3 to pH<2	6 months	250 ml plastic	1 µg/L

[a] All samples to be analyzed at ASL B as per FEMP SCQ specifications and audit requirements.

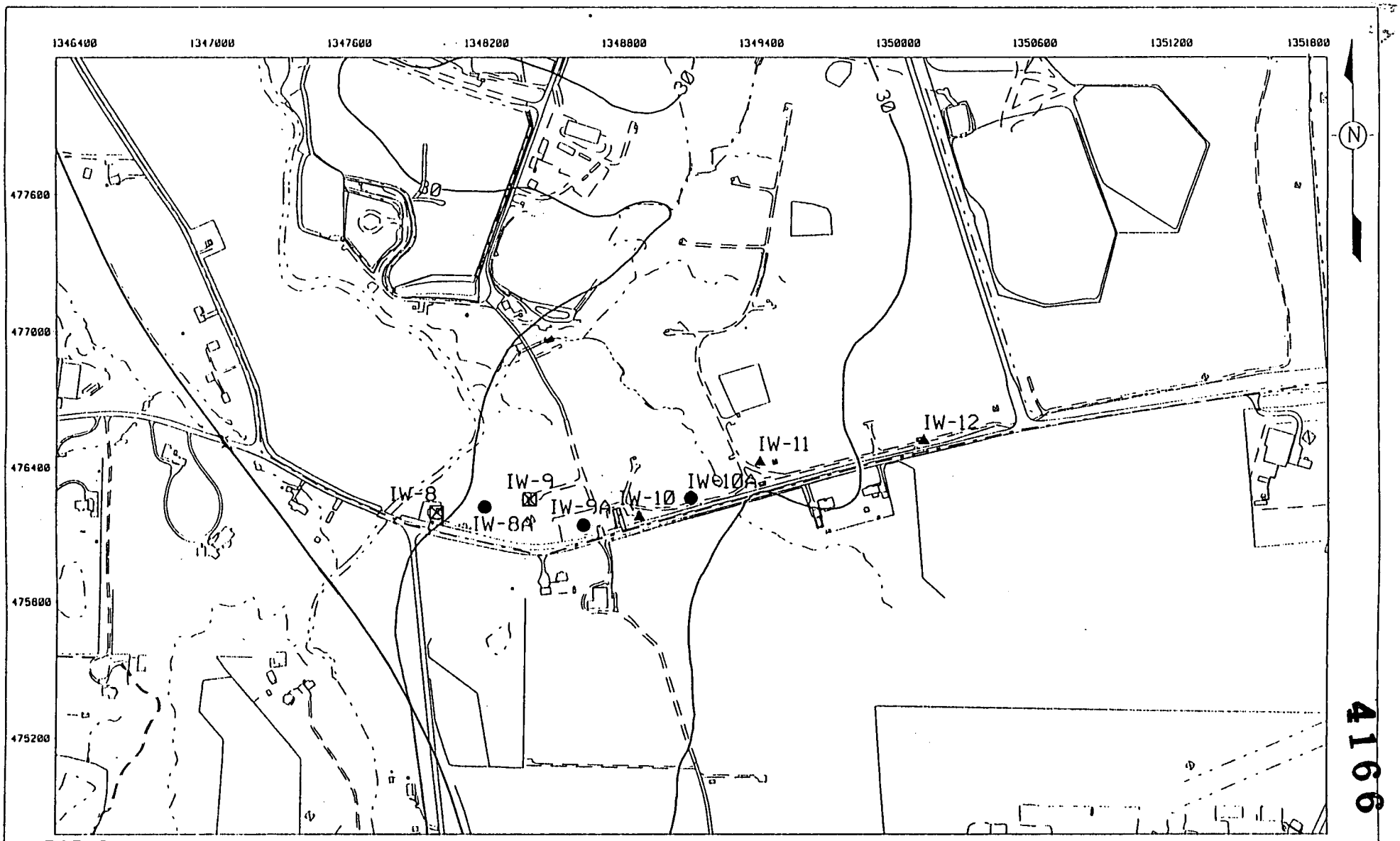

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FIGURE 1 GROUNDWATER REINJECTION WELL LOCATIONS

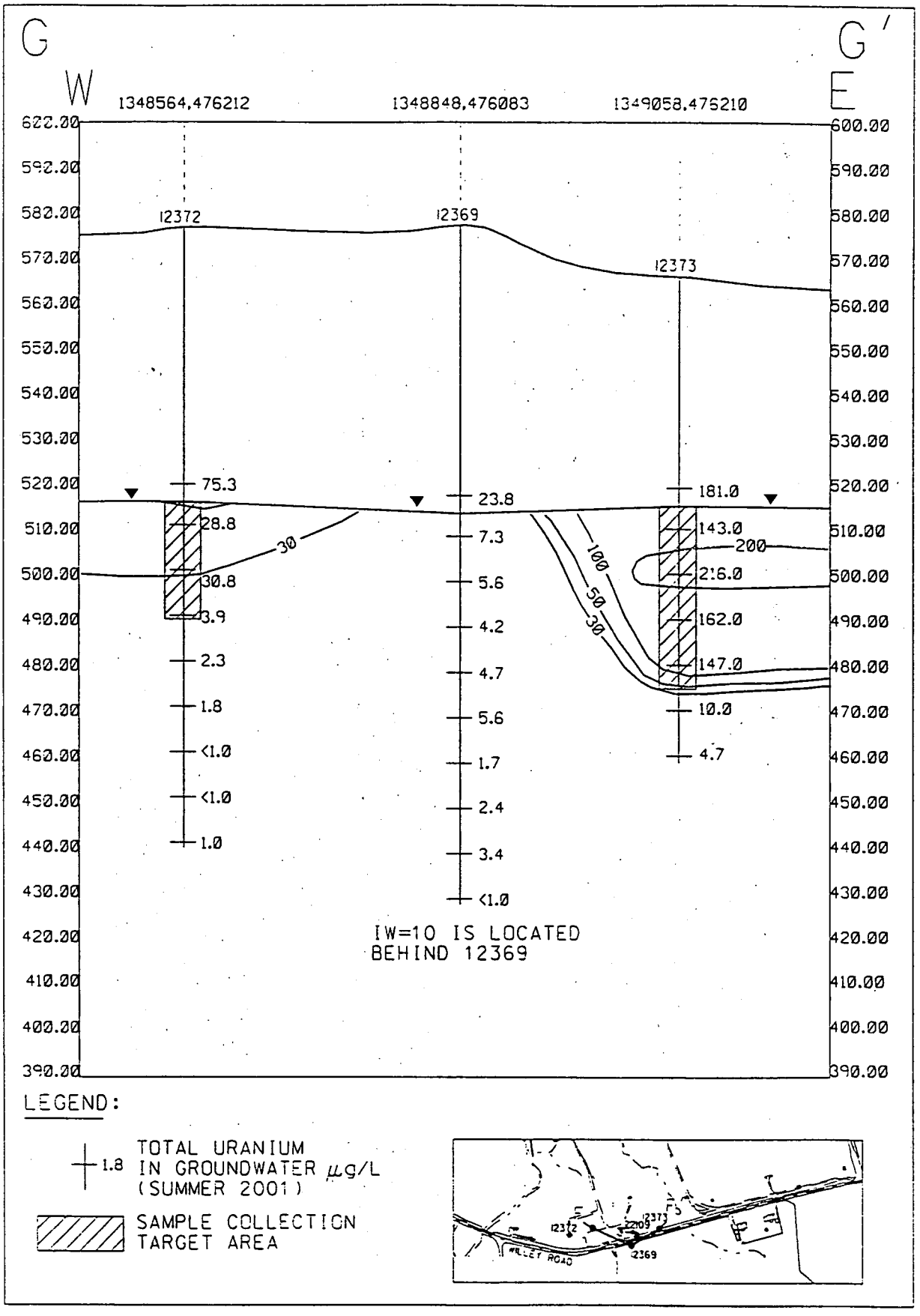

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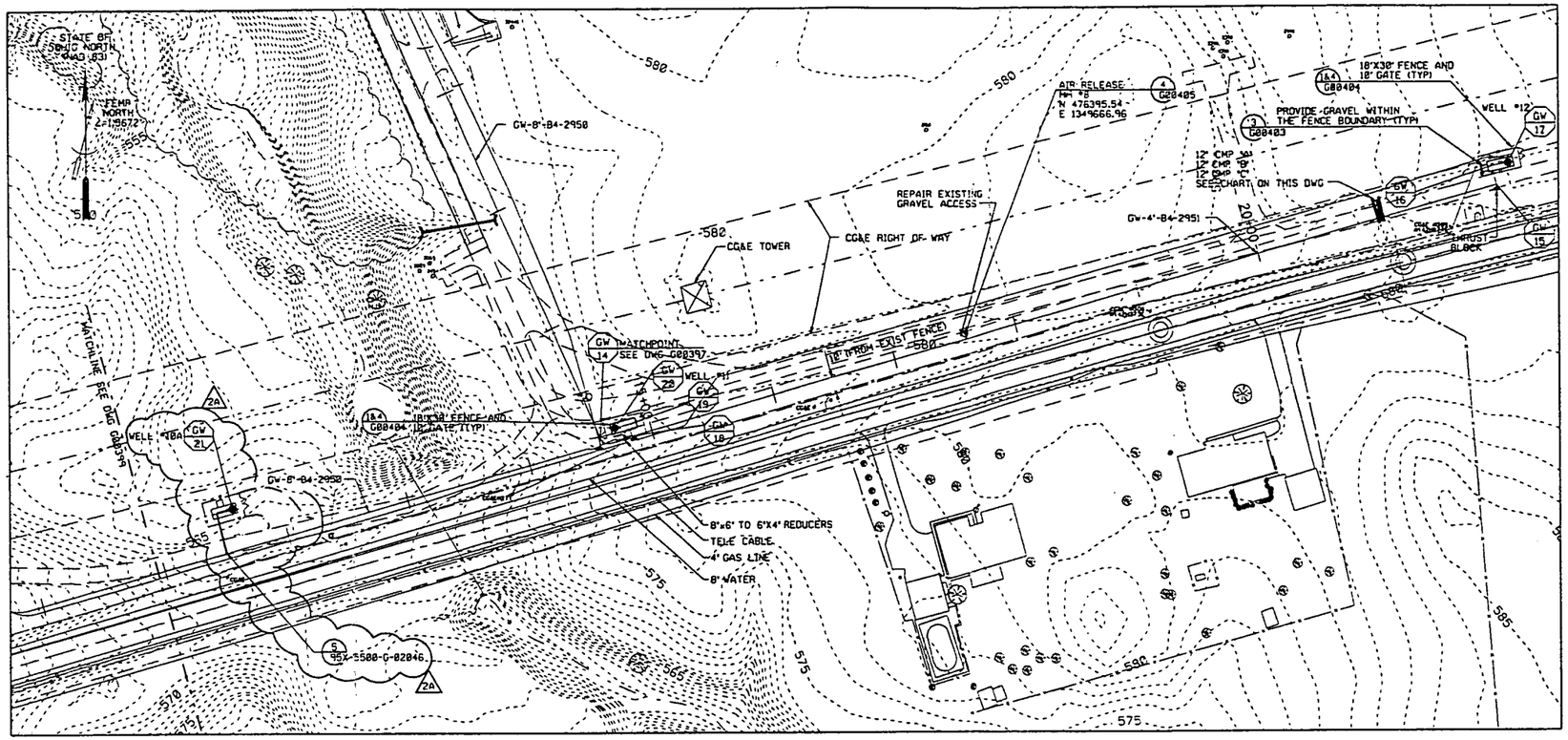
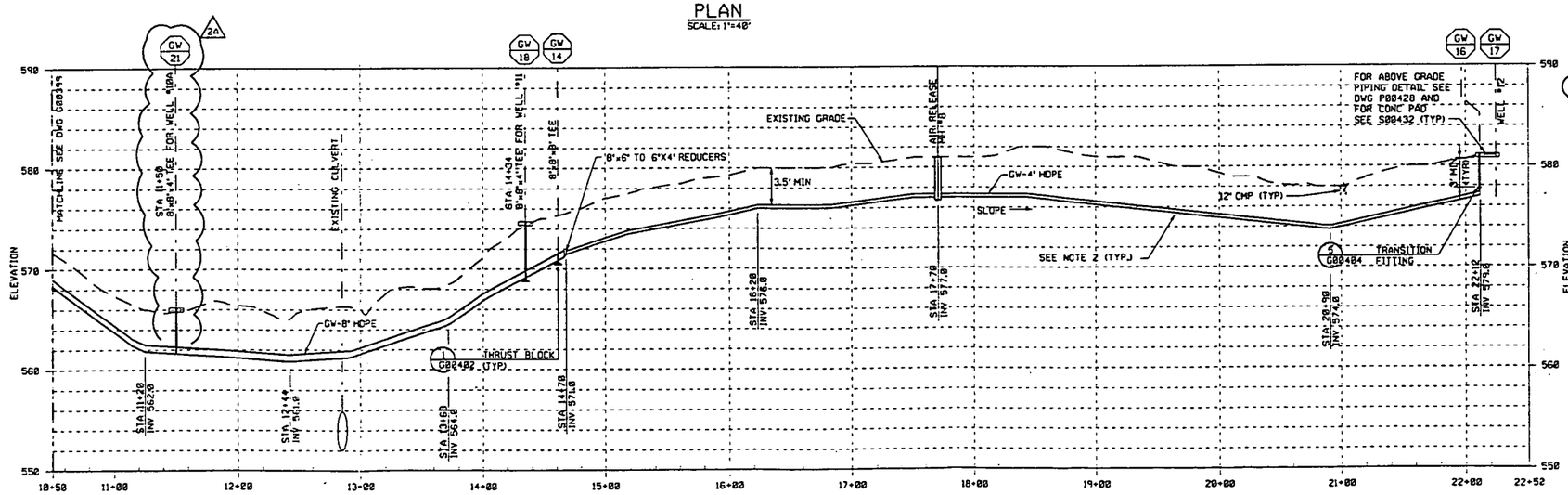
FIGURE 2. CROSS SECTION FROM DIRECT-PUSH LOCATION 12372 TO 12373



PLAN
SCALE: 1"=40'



PROFILE
SCALE: HOR 1"=40'
VER 1"=5'

NOTES

1. EXISTING CONDITIONS SHOWN ON THIS DRAWING WERE PREPARED FROM FEMP SITE PROVIDED DATA LISTED BELOW:
   EXISTING SITE DATA SOURCE (IN PLANT FILES)
   FEMP CADD GRID/UTILITY DRAWINGS
   FEMP CONTRACTOR PROJECT DESIGN DOCUMENTS
   PARSONS TOPOGRAPHY, 1992
2. NO AS-BUILT INFORMATION IS AVAILABLE FOR THE UNDERGROUND PIPING. STATIONING AND INVERT ELEVATIONS ARE UNVERIFIED AND ARE FROM THE CFC DATA.

12" CMP				
PIPE	NORTHING	EASTING	N INV	S INV
A	476499.94	1349996.76	576.73	
A	476480.34	1350081.73		577.89
B	476497.52	1349995.38	576.89	
B	476480.54	1349999.73		577.42
C	476498.66	1349991.93	576.59	
C	476479.26	1349997.64		577.25

UNDERGROUND UTILITY COORDINATES			
POINT	NORTHING	EASTING	DESCRIPTION
14	NO SURVEY	AVAILABLE	8" TEE
15	NO SURVEY	AVAILABLE	90° BEND
16	476523.44	1350085.01	90° BEND
17	476525.81	1350098.05	INJECTION WELL #12
18	NO SURVEY	AVAILABLE	8"x4" TEE
19	476326.75	1349402.97	90° BEND
20	476323.47	1349398.29	INJECTION WELL #11
21	476261.52	1349086.93	INJECTION WELL #10A

REF DWG NO.	DRAWING TITLE
95X-5900-X-00411	DRAWING INDEX
95X-5900-X-00412	LEGEND AND SYMBOLS
95X-5900-G-00397	PLAN AND PROFILE
95X-5900-G-00399	PLAN AND PROFILE
95X-5900-G-00402	DETAILS - 1 OF 5
95X-5900-G-00404	DETAILS - 3 OF 5
95X-5900-G-00405	DETAILS - 4 OF 5
95X-5900-P-00428	PIPING/PLANT DESIGN - PIPING PLAN AND SECTION
95X-5900-S-00432	STRUCTURAL - PLAN, SECTION AND DETAILS
95X-5500-G-02046	DETAIL SHEET

REV. NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	FEMCO	DATE
2A	ADDED REPLACEMENT INJECTION WELLS PER RES4357	-	
1	"AS-BUILT" PER FDF	TH	NA 9/30/98
0	CERTIFIED FOR CONSTRUCTION	TH	NA 6/13/97

REV. NO. — ISSUE OR REVISION PURPOSE - DESCRIPTION — FEMCO INITIALS AND DATE

UNITED STATES DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

THIS DRAWING PREPARED BY
PARSONS
THE RALPH M. PARSONS CO. - PARSONS MAIN, INC. - ENGINEERING-SCIENCE, INC.
CINCINNATI, OHIO

PROJECT NAME
SOUTH PLUME OPTIMIZATION
AND INJECTION DEMONSTRATION

DRAWING TITLE
CIVIL
PLAN AND PROFILE
4 OF 6

DRAWN BY	DATE	LEAD ENGINEER	DATE	ENGINEER OF RECORD	DATE
T. AFSHAR	06/27/96	K. GERARD	6/13/97	E. KLEBER	11/4/96

PLANT/BLDG. NO.	FLOOR	SCALE	CLASS
		AS SHOWN	

SUBMITTED FOR APPROVAL	FEMCO QAU APPROVAL	FEMCO PROJECT NO.
T. HILES 6/13/97	NA	ID-53100

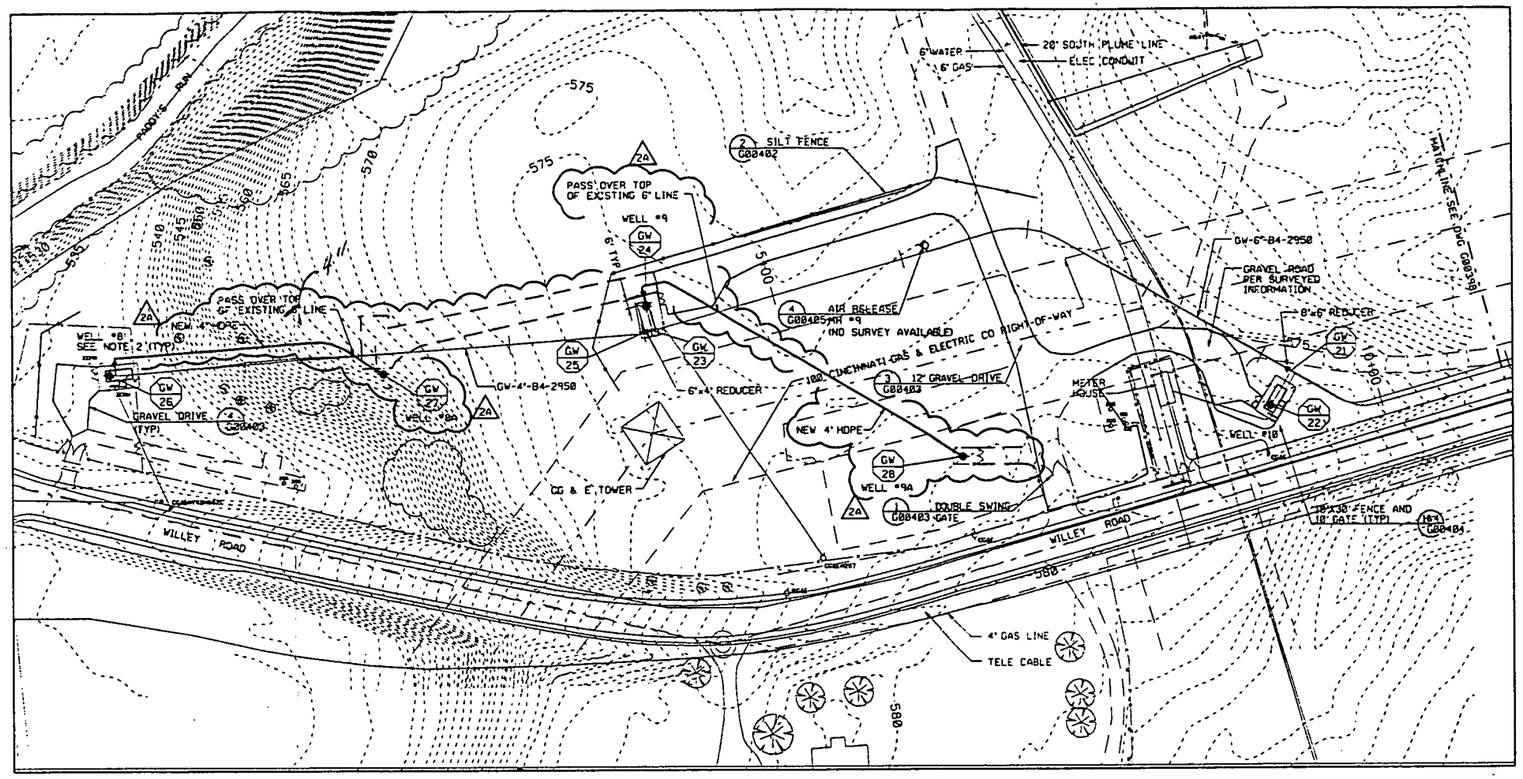
D&E PROJECT NO.	DATE	TEAM PROJECT NO.	DRAWING INDEX CODE NO.	SHEET NO.	REV. NO.
		WBS 1.1.1.1.L2.1 00-9070I	95X-5900-G-00398	G0007	2A

PREPARED UNDER PARSONS PROJECT ORDER NUMBER: ARP/P0169

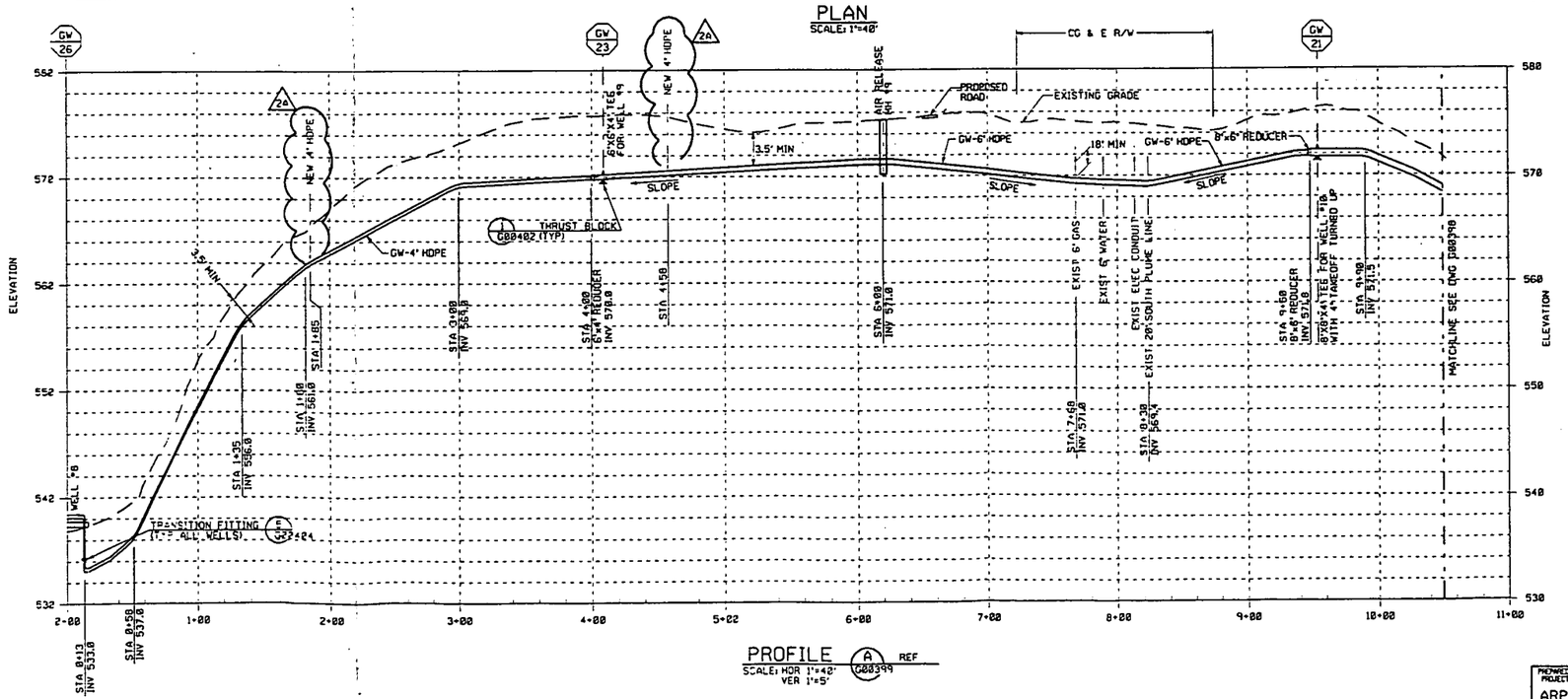
23

STATE OF OHIO NORTH (NAD 83)

FEMP NORTH ∠=1.5672°



PLAN
SCALE: 1"=40'



PROFILE
SCALE: HOR 1"=40'
VER 1"=5'

A C00399 REF

NOTES

1. EXISTING CONDITIONS SHOWN ON THIS DRAWING WERE PREPARED FROM FEMP SITE PROVIDED DATA FROM THE DOCUMENTS LISTED BELOW.

   EXISTING SITE DATA SOURCE (IN PLANT FILES)
   FEMP CADD GRID/UTILITY DRAWINGS
   FEMP CONTRACTOR PROJECT DESIGN DOCUMENTS
   PARSONS TOPOGRAPHY, 1992

2. FOR PIPING DETAILS AT INJECTION WELLS SEE DRAWINGS 95X-5922-P-00419, P-00428 AND FOR STRUCTURAL DETAILS SEE DWG 95X-5900-S-00432.

(GW) UNDERGROUND UTILITY COORDINATES			
POINT	NORTHING	EASTING	DESCRIPTION
21	NO SURVEY	AVAILABLE	8"x4" TEE
22	476180.53	1348854.11	INJECTION WELL #10
23	NO SURVEY	AVAILABLE	6"x4" TEE
24	476255.79	1348383.51	INJECTION WELL #9
25	NO SURVEY	AVAILABLE	BEND
26	476286.73	1347981.87	INJECTION WELL #8
27	476286.73	1348187.87	INJECTION WELL #8A
28	476144.24	1348621.72	INJECTION WELL #9A

2A

REF DWG NO.	DRAWING TITLE
95X-5900-X-00411	DRAWING INDEX
95X-5900-X-00412	LEGEND AND SYMBOLS
95X-5900-G-00398	PLAN AND PROFILE
95X-5900-G-00402	DETAILS - 1 OF 5
95X-5900-G-00403	DETAILS - 2 OF 5
95X-5900-G-00404	DETAILS - 3 OF 5
95X-5900-G-00405	DETAILS - 4 OF 5
95X-5900-P-00419	PIPING/PLANT DESIGN - PIPING PLAN AND SECTION
95X-5900-P-00428	PIPING/PLANT DESIGN - PIPING PLAN AND SECTION
95X-5900-S-00432	STRUCTURAL - PLAN, SECTIONS AND DETAILS
95X-5500-G-02046	DETAIL SHEET

2A

REV. NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	ENGR	PROJECT MGR	INITIALS AND DATE
2A	ADDED REPLACEMENT INJECTION WELLS PER RES4357			
1	"AS-BUILT" PER FDF	TH	NA	5/31/98
0	CERTIFIED FOR CONSTRUCTION	TH	NA	6/13/97

UNITED STATES DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

THIS DRAWING PREPARED BY
PARSONS
THE RALPH M. PARSONS CO. - PARSONS MAIN, INC. - ENGINEERING-SCIENCE, INC.
CINCINNATI, OHIO

PROJECT NAME
SOUTH PLUME OPTIMIZATION AND INJECTION DEMONSTRATION

DRAWING TITLE
CIVIL
PLAN AND PROFILE
5 OF 6

DRAWN BY	DATE	LEAD ENGINEER	DATE	DESIGNED BY	DATE
Y. AFSHAR	05/27/98	K. GERARD	6/13/97	E. KLEBON	12/4/96
PLANT/BLDG. NO.		FLOOR		SCALE: AS SHOWN	
SUBMITTED FOR APPROVAL: TH 6/13/97 DATE		FERNCO CHJ APPROVAL: NA DATE		FERNCO PROJECT NO.: ID-53102	
D&E PROJECT NO.		FEMP PROJECT NO.: WBS 1.1.1.1.2.1 00-90701		DRAWING INDEX CODE NO.: 95X-5900-G-00399	SHEET NO.: G0023	REV. NO.: 2A
PREPARED UNDER PARSONS PROJECT ORDER NUMBER: ARP/P0169					

24